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to them were secured by placing the nectar so that the visitor in obtaining it would strike the anthers in one case and the stigma in the other. The advent of the bees, which feed their young principally on pollen, and whose most abundant and most efficient visits are for that purpose, has changed the conditions. The flowers best adapted to bees are those whose receptive stigmas are so near the dehiscing anthers that the bees cannot collect the pollen without coming in contact with the stigmas. Diclinous, dichogamous, and large flowers are often visited by bees which rarely touch the stigmas. The diclinous plants particularly seem to suffer from having their pollen carried away by female bees which pay little attention to the pistillate flowers. Under these conditions it is a question whether anemophily would be much more expensive or precarious for many diclinous entomophilous flowers.

In many cases the views here advanced are not supported by the Engler and Prantl classification, and involve a criticism of that system. But they are supported by the modification of the systems of Engler and Prantl, and Bentham and Hooker, proposed by Bessey in the BOTANICAL GAZETTE **24**: 145–178. 1897, and, as far as they go, tend to supplement his conclusions regarding the taxonomy of angiosperms That author says nothing about the mode of pollination, but the forms which he selects as primitive involve the conclusion that the original forms were entomophilous. Bessey places a number of controverted families in entomophilous groups: Salicaceae after Tamaricaceae in Caryophyllales; Urticaceae in Malvales; Fagaceae, Betulaceae, and Juglandaceae in Sapindales; Typhaceae with Aroideae in Nudiflorae. —CHARLES ROBERTSON, *Carlinville, Ill.*

ARCTERICA, THE RAREST GENUS OF HEATHERS.

(WITH TWO FIGURES)

IN the Harvard University Herbarium is a specimen of an ericaceous plant which has a singular and interesting history. The specimen is a mere fragment, 43^{mm} in length, yet its characters are so clear and remarkable that Dr. Asa Gray in 1885 described it as a new species, *Cassiope oxycoccoides*,[2] and the present writer, while segregating two species from Cassiope under the generic name Harrimanella in 1901,[3] found in this plant sufficient characters to warrant setting it aside as a third genus, Arcterica.

[2] GRAY, A., Proc. Am. Acad. **20**:300. 26 Ja 1885; GRAY in STEJNEGER, Proc U. S. Nat. Mus. 7:534. 27 Ja 1885.

[3] COVILLE, F. V., Proc. Wash. Acad. Sci. 3:569–576. *figs. 62–66.* 1901.

The home of Arcterica is Bering Island, off the coast of Kamchatka, remote geographically from any center of civilization, and having only occasional communication with its political parent, Russia. The specimen was collected by Dr. Leonhard Stejneger, of the United States National Museum, in 1882, when as a zoologist he was investigating the fur seals of the Commander Islands, to which group Bering Island belongs. The single twig of Arcterica was picked up accidentally among some specimens of *Bryanthus Gmelini.* In subsequent visits to the island Dr. Stejneger attempted to find the plant again, but was unable to rediscover it.

It was upon Bering Island that George Wilhelm Steller, the botanist, passed the winter of 1741–42, while thirty men out of seventy-six died from scurvy and exposure, including Bering himself, the leader of the expedition. While the survivors were rebuilding their boat, Steller busied himself with collecting, and by the time the expedition sailed from the island, on August 14, 1742, he had secured a fair representation of the plants which had flowered up to that time, 211 species altogether.

With the notion that Steller must have collected Arcterica on Bering Island, and that his specimens had lain unnamed for more than a century and a half in the great botanical gazophylacium of Russia, the writer in September last visited the herbarium of the Imperial Academy of Sciences, in the city of Peter the Great, and waited in breathless expectancy at the foot of a stepladder, while the courteous curator upon its summit explored the upper pigeonholes for Steller's specimens. At last the answer came down, in the form of that conclusive and irrevocable Russian *nyet,* with which we are more familiar in its Americanized form, "nit," recently current among street boys.

There seems to be little hope that other specimens of Arcterica will come to light, except such as may be discovered hereafter by some diligent collector who searches carefully for it on Bering Island. The exact spot on which it was found by Stejneger, on August 22, 1882, was "a rounded hill, about 300 feet high, just behind the fishing settlement of Saranna. The hill rises up from the shore of Lake Saranna, and is the first one when following the track of the dog sledges to the main village." The accompanying illustration and description will aid in the identification of the plant.

DESCRIPTION OF THE TYPE SPECIMEN OF ARCTERICA OXYCOCCOIDES.

Specimen a branched twig 43^{mm} in length, bearing leaves and flowers. (*Fig. 1.*)

Twigs 1^{mm} or less in diameter, minutely pubescent, bearing at intervals of $2-8^{mm}$ whorls of three leaves.

Leaves on petioles about 1^{mm} in length, oblong, $4-6^{mm}$ long, $2-3^{mm}$ wide, apparently evergreen, very thick, coriaceous, entire, smooth or with traces of pubescence along the margins or in the median groove on the upper surface of the leaf, the margins revolute, the stout midrib very prominent beneath, the blunt apex of the leaf bearing a large gland. The leaves bear a striking resemblance in size, form, and texture to broad leaves of *Chamaecistus procumbens*, but in the latter plant the lower surface is pubescent between the midrib and the margins, and the terminal gland is wanting. The terminal gland of our plant is similar to that of *Vaccinium Vitis-Idaea* and the South American species of Gaylussacia.

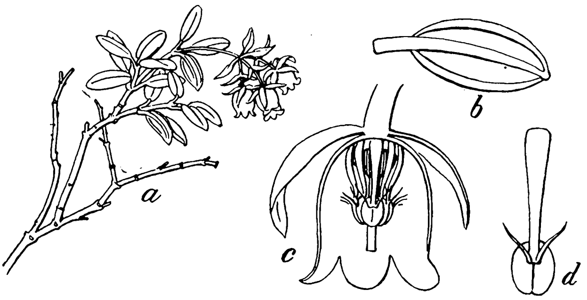

FIG. 1.—*Arcterica oxycoccoides* (Gray) Coville. *a*, the type specimen, natural size; *b*, leaf from beneath (× 3); *c*, flower, with part of calyx and corolla cut away (× 5); *d*, stamen (× 10).

Inflorescence a terminal cluster of three flowers, the peduncle 6^{mm} long and bearing at its summit a whorl of three purplish bracts, these about 4^{mm} long, the lower half conduplicate, the upper half expanding into an ovate-triangular blade; pedicels about 3^{mm} long with two opposite bracts near the middle, similar in size and appearance to the sepals.

Flower pentamerous. Calyx made up of lanceolate-oblong, purplish, acute sepals, pubescent at the apex on the margins and upper surface. Corolla cylindrical-urceolate, longer than broad, apparently white, about 4^{mm} in length, the rounded lobes about one-third the length of the tube. Ovary globose, the style cylindrical. Filaments larger toward the base, glabrous; anthers broadly oval to orbicular, biaristate near the base, the point of attachment to the filament, the dehiscence taking place through two apical pores facing the style.

The following generic characters, observed in the foliage and inflorescence, serve to distinguish Arcterica from Cassiope and Harrimanella:

CASSIOPE.	ARCTERICA.
Leaves opposite, cupressiform, imbricate, calcarate.	Leaves in whorls of three, chamaecistiform, with an apical gland.
Flowers axillary.	Flowers in terminal clusters.
Sepals with a transverse fold at the base.	Sepals not folded at base.
Anthers attached toward the apex.	Anthers attached by the base.

HARRIMANELLA.	ARCTERICA.
Leaves alternate, empetriform.	Leaves in whorls of three, chamaecistiform.
Flowers singly terminating the stems, not bracted.	Flowers in clusters, the pedicels subtended by a bract and bibracteolate at about the middle.
Style ovoid-conical.	Style cylindrical.
Anthers attached toward the apex.	Anthers attached by the base.

Illustrations of three species of Cassiope and two species of Harrimanella are given in the Washington Academy paper to which reference has already been made. In both Harrimanella and Cassiope the pollen pores, the two awns, and the point of attachment of the filament are close to the apex of the anther, but in Arcterica the filament and two awns are attached near the base of the anther, only the pollen pores being terminal. (*Fig. 2.*)

Superficially, in habit and foliage, Arcterica presents an appearance intermediate between *Chamaecistus procumbens* and *Vaccinium Vitis-Idaea*, but its leaves, situated in whorls of three, and its stamen characters suggest possible relationship to Erica. Apparently, however, it is not congeneric with any known species of that genus. Its corolla is not chartaceous; it is a depressed plant barely rising above the mosses and lichens among which it grows; its leaves have peculiar apical glands; and it is geographically isolated from the rest of the Ericae, none of which are known from either northeastern Asia or northwestern America. Whether the plant is more nearly related to Cassiope and Harrimanella, and belongs therefore to the tribe Andromedeae, or to Erica, of the tribe Ericeae, is a question likely to remain unanswered until fruiting specimens are available.

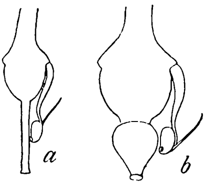

FIG. 2.—*a*, pistil and stamen of *Arcterica oxycoccoides*, showing attachment of awns and filament; *b*, the same organs in *Harrimanella stelleriana* (both × 5).

An attempt was made to explain the specimen on the ground that it was a hybrid, but there appear to be no two plants on Bering Island from which the characters found in Arcterica could be produced.—FREDERICK VERNON COVILLE, *Dept. of Agriculture, Washington, D. C.*

NEW PRECISION-APPLIANCES FOR USE IN PLANT PHYSIOLOGY.[1]

(WITH THREE FIGURES)

THE development of apparatus in this country for educational use in plant physiology has taken almost exclusively the direction of improvisation of the needful pieces from various existent physical, chemical, and mechanical articles, especially such as are very cheap and everywhere easy to obtain. In giving our inventions this turn it is evident that we have had in mind the needs of the smaller, poorer, and more backward institutions rather than the needs of the larger, richer, and more progressive; while, following the tendency usual in such cases, we have allowed ourselves to be carried to the extreme of reaction from the elaborate, costly, and mostly unpurchasable appliances previously used in this work. Improvisation has now, I believe, been carried to its utmost practical limit, and even to a greater extent than is educationally and scientifically desirable. Improvised apparatus certainly has its place and value, especially in that it permits the study of plant physiology in many places where otherwise it would be impossible, while its preparation cultivates a certain mechanical ingenuity and self-reliance. In general it is certainly true that such apparatus is vastly better than no apparatus. But it has also very great disadvantages, notably the waste of time commonly involved in its preparation and manipulation, in the inevitable inaccuracy of results, and above all in the wrong habit and erroneous ideal of scientific method inculcated by the use of such imperfect tools. Further, experience shows that the training in manipulation, while of value in itself, is gained at too great a cost of botanical training and knowledge; for usually the time and energy of the student are so fully absorbed in the preparation of the apparatus that he has little of either remaining for use in the study of the plants.

These facts, I believe, indicate that the next step needful in plant

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[1] These appliances, with others to be described later, were exhibited and explained at the Philadelphia meeting of the Society for Plant Morphology and Physiology, December 30, 1903.